The present studies were carried out at Punjab Agricultural University, Regional Station, Abohar, India, during the year 2003. The exotic citrus plant material imported by Punjab Agro Export Corporation limited (PAGREXCO) from USA. Nine sweet orange (*Citrus sinensis* Osbeck) cultivars i.e .Early Gold, Itaborai, Hamlin, Ruby Nucellar, Weston, Vernia, Trovita, Mid Night Valencia, Olinda Valencia and two mandarins (*Citrus reticulate*)/tangerines i.e. Clemenules & Marisol budded on five different rootstocks i.e. Carrizo (*Poncirus trifoliate* x *Citrus sinensis*), Swingle (*Poncirus trifoliate* x *Citrus paradissi*), C-35, Rubidoux Trifoliate and 852 received from Pepsi Foods Development Pvt. Ltd. Jallowal farm. Jalandhar were included in the study to find out the suitable cultivar/s for processing. Three plants represented as a treatment unit and replicated three times in a randomized block design. Total 160 plants of 17 different stock – scion combinations were planted at spacing 25' x 15' under drip irrigation system. Based on the studies, the results by 2007 showed that Hamlin on Carrizo & Swingle, Ruby Nucellar & Clemenules on Carrizo are performing better in respect of growth and tree survival whereas Early Gold on 852, Clemenules on C-35 and Midnight Valencia on Carrizo are not performing well by producing pale green foliage. Average No. of fruit per plant was more in Clemenules on Carrizo (50.55) followed by Ruby Nucellar on Carrizo (49.44), Clemenules on C-35 (36.0), Marisol ( 32.60) and Hamlin on Carrizo (31.75) as compared to other stock-scion combinations. With regard to quality parameters, Clemenules on Carrizo & C-35, Marisol on Carrizo bore granulated fruits with 15.63 to 18.88 percent juice content whereas Itaborai, Ruby Nucellar and Early Gold sweet oranges on Carrizo rootstock produced fruits with more juice content (52.13 to 53.13 percent). Similarly these sweet oranges and mandarins bore fruits with TSS content (10.2 to 10.4 %) and acidity (0.67 to 0.80 %).

[P4]

**"Japy": a *Citrus Tristeza Virus* resistant tangelo**

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Food security of many countries depends upon irrigated agriculture and about 20% of irrigated agricultural land and 2% of dry land agriculture are affected by salinity. Growing population demands more production, so enhancing the productivity of stress affected lands, is needed. In commercial citriculture, sour orange (*Citrus aurantium* L.) has been a universal rootstock and it is still used in many countries because its capability of growing in calcareous and saline soils and being tolerant to several serious diseases such as gummosis, exocortis, xyloporosis and blight. However, during the last 70 years, more than 85 million sweet orange and mandarin trees grafted on sour orange have been destroyed because of tristeza all around the world. Eight years ago our group started a breeding program to obtain new citrus varieties that resist *Citrus Tristeza Virus*, the viral agent of tristeza disease. In addition of being a biological barrier against CTV spread, the resistance will allow their graft-propagation on sour orange as rootstock. Here we report a first selection within the program, "Japy", a CTV resistant tangelo whose fruit quality features are in between a pummelo and a clementine mandarin. Thus, it is shown that CTV resistance can be transferred to citrus varieties through classical breeding.

[P5]

**Citrandarins as Rootstocks for Valencia Sweet Orange Trees under Tristeza and Blight Conditions**

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Valencia sweet orange trees, nucellar clone, budded onto 13 rootstocks, mainly citrandarins and others trifoliate hybrids, were planted in 1988 on a sandy textured Oxisol in São Paulo state, Brazil, and managed without irrigation. Tristeza and blight diseases are endemic in the area. Trees on the citrandarins Sunki x English (1628), Cleopatra x Rubidoux (1660) and Cleopatra x English (710), produced the highest cumulative yields in the first five and in the thirteen crops. Carrizo and Troyer citranges gave the lowest productions in the first five yields but were similar to Sunki x English (1628) citrandarin in 13-years cumulative yields. The citrandarins Clementine x Trifoliate (1615), Cleopatra x Swingle (715), Cleopatra x Swingle (1614), Cleopatra x Rubidoux (1600) and Cleopatra x Christian (712) induced dwarfed trees. Sunki x English (1628) citrandarin and Troyer and Carrizo citranges induced the largest trees, and fruit and soluble solids production by tree in the 2001-2003 period. No one tree showed symptoms of tristeza or blight. All trees on Rangpur lime x Carrizo citrange (717) showed bud-union-ring symptom of incompatibility. Seedlings of the citrandarins Cleopatra x Swingle (1587), Cleopatra x Trifoliate (1574) and Cleopatra x Rubidoux (1600) were more resistant to *Phytophthora parasitica* infections than the others rootstocks.

[P6]

**Genetic conformity Assessment of C35 Citrange Seedlings by SSR Markers**

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C35 citrange rootstock has been widely investigated in the last decades in most countries that produce Citrus and knows an increasing interest of the citrus growers. Now day, this rootstock is available for clementine growers in Corsica owing to the good yield and good fruit quality conferred to the clementine. In order to use this rootstock for agronomic trials, we investigated its genetic conformity. For this purpose, we selected C35 seedlings by discarding off-type seedlings by visual evaluation. We then characterized the molecular conformity of those rootstocks. DNA of eighty six selected plants was extracted from leaves. Five SSR markers presenting heterozygous profiles for C35 were used in order to discriminate zygotic plants. Twenty eight percent of the plants were proved to be zygotic. So it can be expected that a higher percentage of the initial plants was zygotic. In order to confirm this result, we currently investigate a new set of C35 seedlings not submitted to visual selection as well as a set of Carrizo citrange seedlings. Indeed, Carrizo has been largely investigated and is known to have a low percentage of zygotic plants. If C35 rootstock presents such a large percentage of zygotic in its seedlings, it might induce risks of yield or fruit quality heterogeneity in commercial orchards as well as the lost, by genetic segregation, of resistance for very important diseases such as Tristeza or *Phytophthora*.

**[P7]**

**Identification of QTLs Associated with Citrus *Phytophthora* Gummosis Resistance in Swingle Citrumelo**

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*Citrus* gummosis, caused by *Phytophthora spp*, is an important disease in Brazil. Almost all citrus rootstock varieties are susceptible in some degree, whereas resistance is present in *Poncirus trifoliata*, a relative genus. The objectives of this study were to detect QTLs associated to citrus *Phytophthora* gummosis resistance in Swingle citrumelo (*Citrus paradisi* x *C. reticulata*) map, obtained previously, and to select resistant hybrids. Ninety six individuals of the $F_1$ progeny obtained by controlled crosses of Rangpur lime (*Citrus limonia,* susceptible), and Swingle citrumelo (resistant) were evaluated. Resistance to *P. parasitica* was evaluated by inoculating stems of young plants using a needle containing the mycelia and measuring lesion lengths two months later. Two QTLs were detected associated to gummosis resistance on linkage map. The low character heritability and the detection of more than one QTL associated with citrus *Phytophthora* gummosis resistance showed that inheritance of this characteristic is quantitative in Swingle citrumelo.

**[P8]**

**Evaluation of the infection and multiplication of *Ca.* L. asiaticus through qPCR in Sunki mandarin, *P. trifoliata* and hybrids**

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*Huanglongbing* (greening) is considered the most serious disease of citrus and so far there is no report about any commercial citrus variety resistant to the bacterium. In light of this fact, in order to understand this pathosystem, we have carried out a study of the ability of infection and multiplication of the bacteria *Ca* L. asiaticus in citrandarins (mandarin Sunki x *P. trifoliata*). To do this, first we did a study of the capacity of bacteria replication in such parents. An analysis using qPCR was made with six biological repetitions of each individual, setting up the curve of infection time. The plants were grafted with two buds infected with HLB and the leaves were collected during periods of 15, 30, 60, 90 and 120 days after inoculation. After extraction and quantification of DNA, the samples were standardized to the same concentration. The results obtained by qPCR indicated that there is difference in the multiplication of bacteria between the two species. The Ct (threshold cycle) of mandarin Sunki is less than that of *Poncirus*, showing that bacteria multiply faster in the mandarin. These results indicate a great potential for detection of contrasting hybrids for HLB resistance/susceptibility in population of the citrandarins, and this result would be very useful for the mapping of this characteristics.

**[P9]**

**Genetic Diversity Analysis of Moroccan Mandarin (*Citrus reticulata* Blanco) Germplasm using SSR markers**

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The genetic variation in the mandarin group (*Citrus reticulata* Blanco) is associated with sexual hybridization among a great number of species and intraspecific hybrids. Somatic mutations which are the main reason for genetic diversity in other groups like sweet orange (*Citrus sinensis* Osbeck), account for additional diversity within groups of